



# **Armed Forces College of Medicine AFCM**



# **Histological structure of Large intestine and anal canal**

**Dr. Nevine Bahaa**

**Professor of Histology and Cell Biology**

# INTENDED LEARNING OBJECTIVES (ILO)



**By the end of this lecture the student will be able to:**

- Describe the histological structure of different parts of large intestine and anal canal.
- Correlate the histological structure of the large intestine and anal canal to their function
- Interpret the altered microscopical structural changes of colon in different diseases.

## Key points of this lecture



- Microscopic characteristics of the colon.
- Comparison between cells lining colonic mucosa.
- Colon structure in diverticulosis and Hirschsprung disease.
- Microscopic structure of appendix vs rectum vs colon.
- Rectoanal junction structure and relation to occurrence of piles.

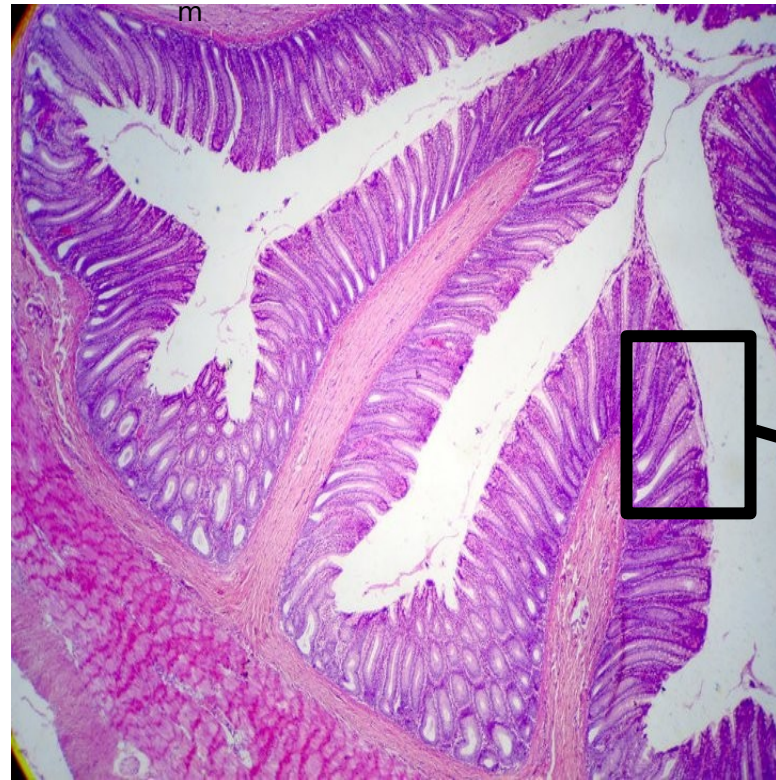
# Structure of cecum & colon



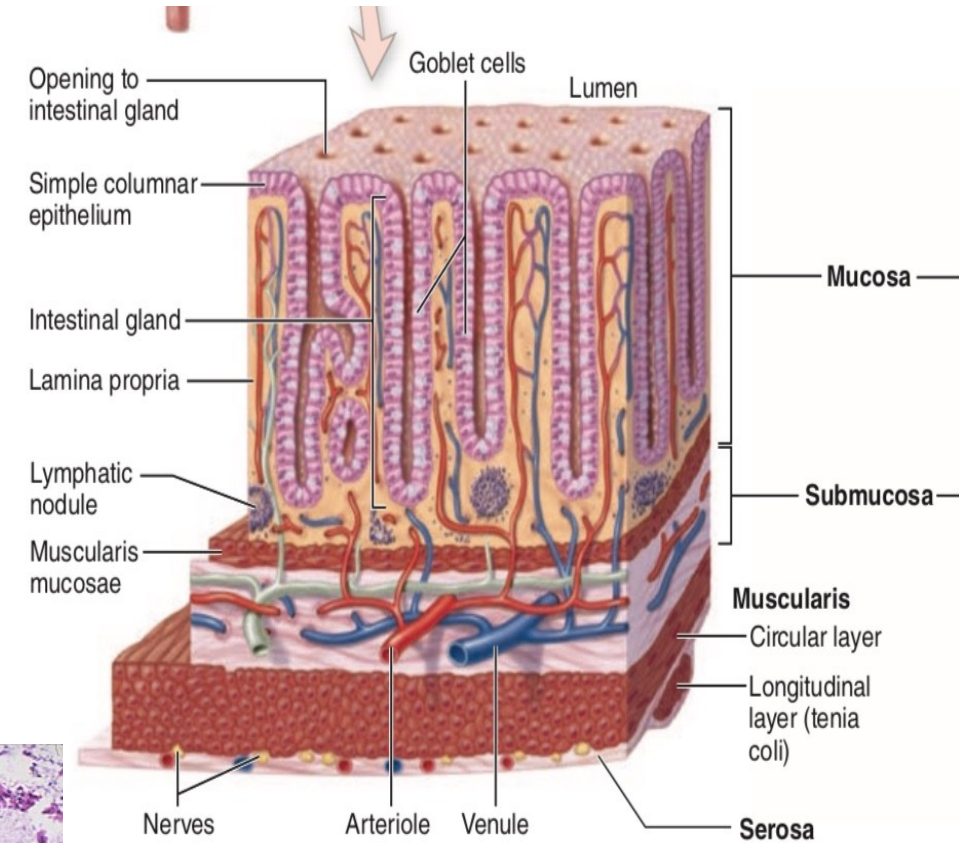
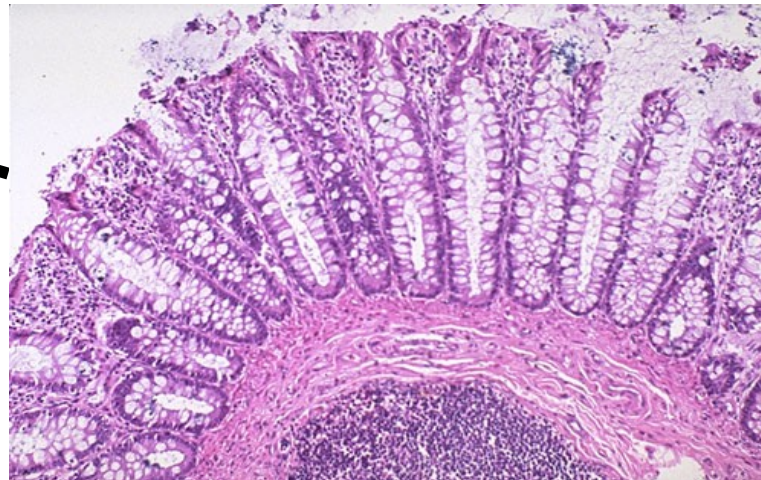
## 1- Mucosa

- Thrown into folds.
- No villi - Crypts are deep & wide.

thumbs.dreamstime.co  
m



library.med.utah.edu





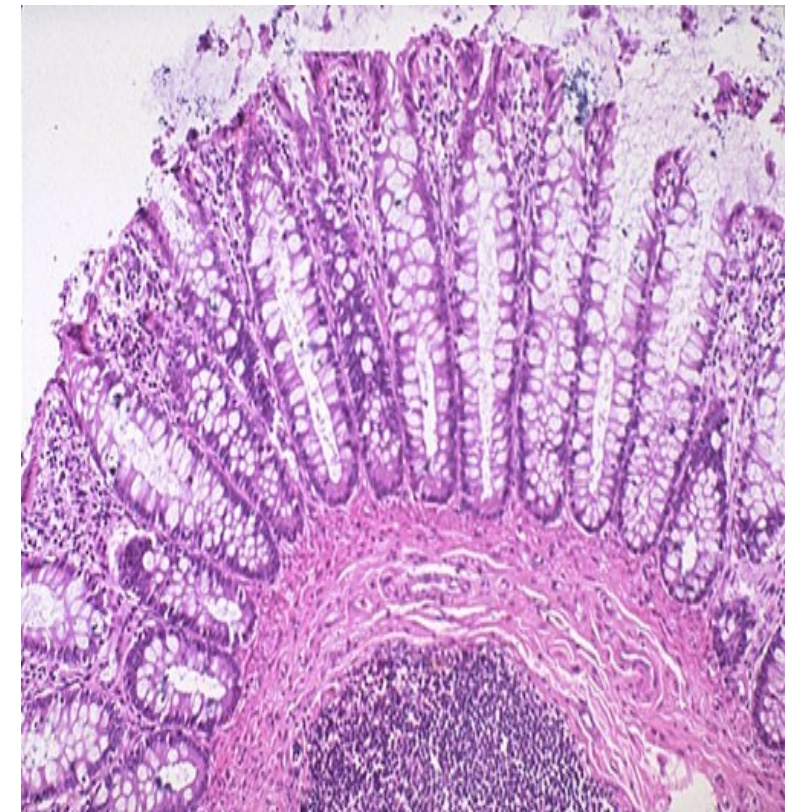
# Structure of cecum & colon



## a) Epithelial lining:

- Simple columnar epith.
- Cells as small intestine, but **NO Paneth cells**

- Absorptive Columnar cells (colonocytes).
- **Numerous** Goblet cells.
- Few Enteroendocrine cells.
- Stem cells: at base of the crypts
- *M cells may be present over large lymphoid nodules*



### **b) Lamina Propria**

C.t. occupied by crypts (**G**lands) + rich in lymphatic nodules (**G**ALT) (d.t. presence of many bacteria).

### **c) Muscularis Mucosa** (IC, OL).



thumbs.dreamstime.co  
m

# Epithelial lining of large intestine.

## + M cells on large



### lymphatic follicles

Cell	Colonocytes	Goblet	Enteroendocrine	Stem Cell
<b>LM</b>	Acidophilic cytoplasm Brush border, Basal oval nucleus	Wide apex, narrow base, basal basophilia and vacuolated apical part	Need silver stain, chromium stain or immunostaining	Columnar in shape and present in base of the crypt with basophilic cytoplasm
<b>EM</b>	Mitochondria, sER, rER, Golgi complex,  - Irregular microvilli - Junctional complex	Basal part contain rER, Golgi complex ,mito chondria and apical secretory mucous granules	-Two types: closed and open. - It contains rER, Golgi complex , mitochondria and <b>basal</b> secretory	- Free ribosomes - Little other organelles.



# Structure of cecum & colon



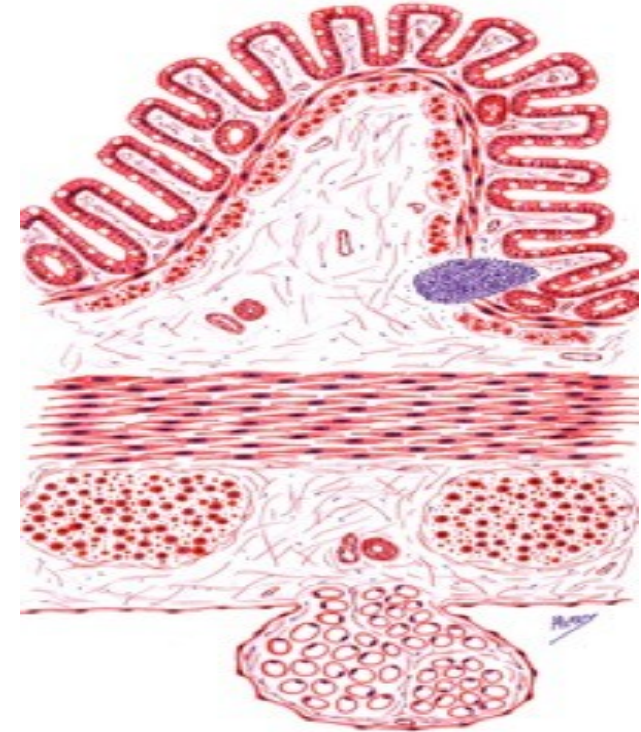
2- Submucosa + Meissner's plexus. No glands.

3- Muscularis

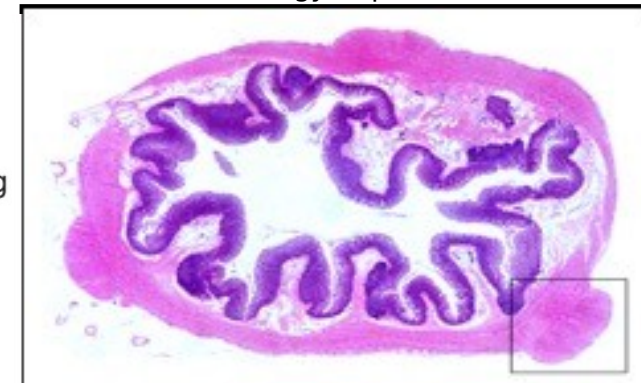
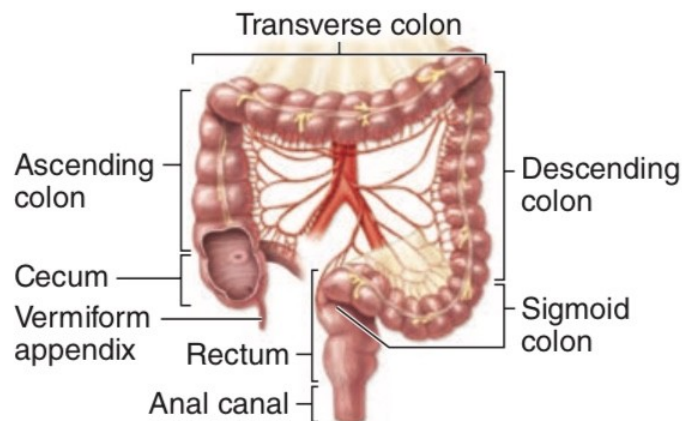
Myenteric plexus  
Circular layer is not continuous

present in **3 bundles or bands** called **Taenia Coli.**  
(ribbons of the colon)

make the haustra of  
large intestine (pouches).



Histology department ASU



embryology.med.unsw.edu.au

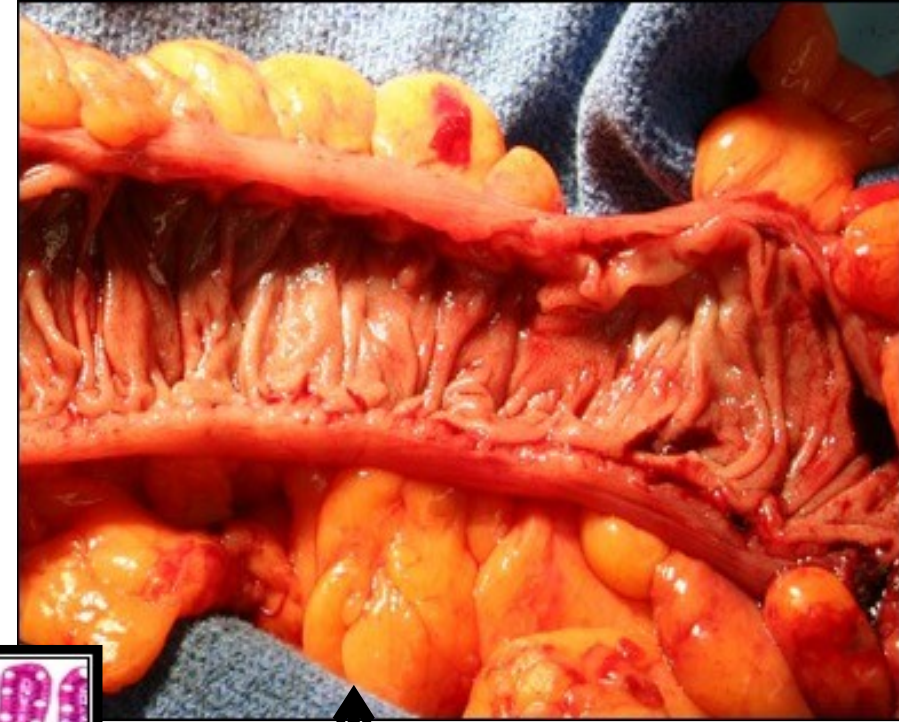
# Structure of cecum & colon



## 4-

### Serosa

- Serosa of C.T. rich in fat cells, covered with peritoneum (simple squamous mesothelium).
- Accumulation of adipose cells beneath the peritoneum forms pouches called appendices epiploicae.



chirurgie-im-  
bild.

**Appendices epiploicae**



## *Lecture quiz*



**Which of the following is the cause of the abundance of the goblet cells in the colon?**

- a) More water absorption
- b) Lubrication of hard feces
- c) Storage of vitamin A
- d) Decrease gut motility
- e) Secretion of gastrin

# Clinical application Hirschsprung disease

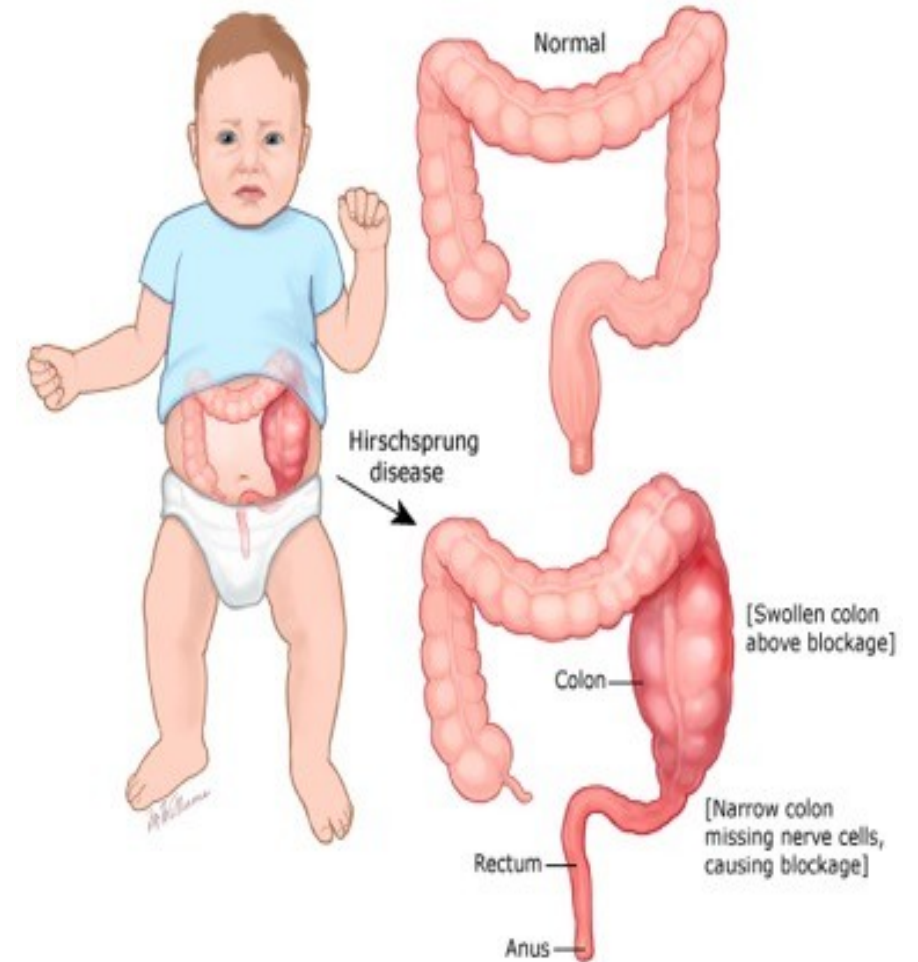


= **Congenital megacolon**

Absent enteric nervous system  
(*Meissner's and myenteric plexuses*)



Disturbs digestive tract motility  
&  
produces dilations in some areas



[webservices.lexi.com](http://webservices.lexi.com)



# Clinical application Diverticulosis



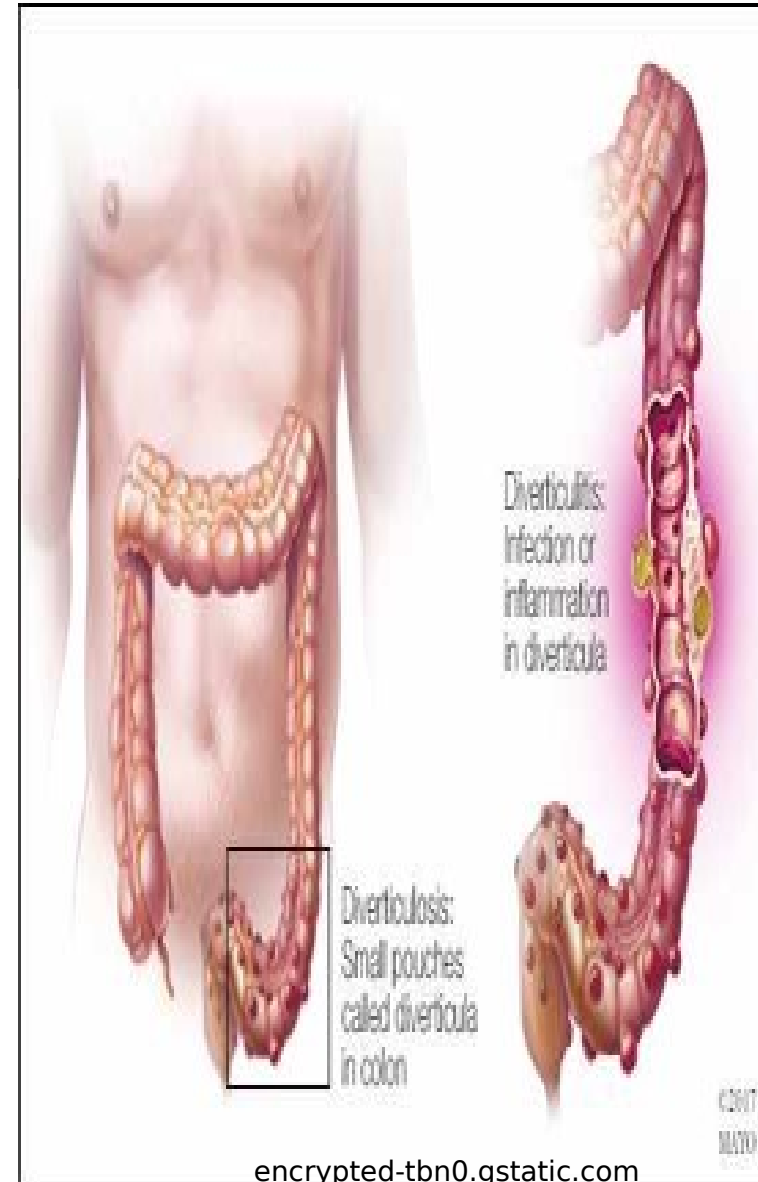
It is a case of herniation or out pocketing of the **mucosa and submucosa** of the colon between the taenia coli, forming bulges (diverticula).

## Causes

Structural defects in the colon wall

High intraluminal pressure

Constipation





**Disturbance in GIT motility encountered in Hirschsprung disease is the result of which of the following?**

- a) Hypersecretion of mucosal glands
- b) Hypersecretion of submucosal glands
- c) Loss of longitudinal folds of esophageal wall
- d) Absence of neurons of enteric nerve plexuses
- e) Constricted areas in some segments of the colon

# Structure of vermiform appendix

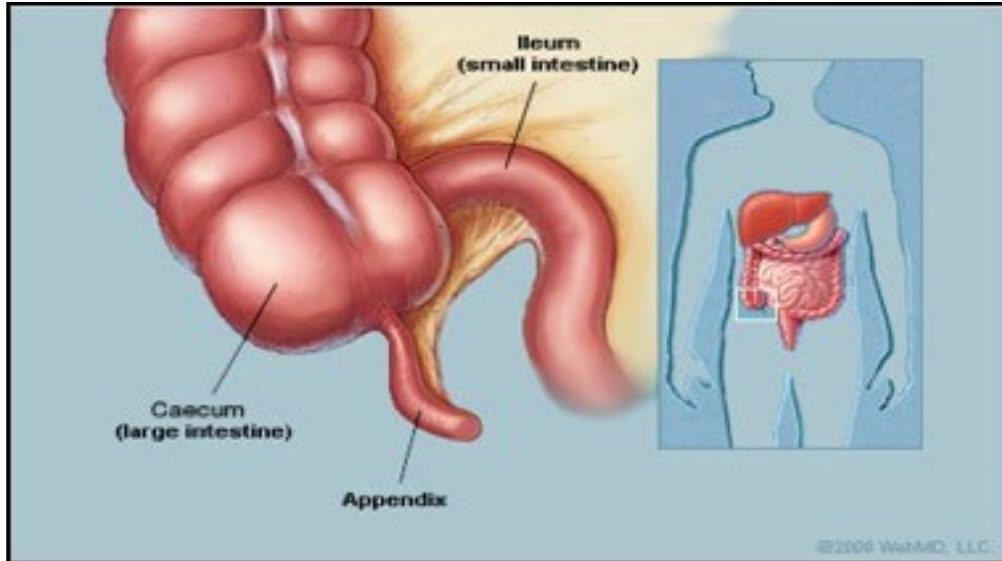


- **Definition:**

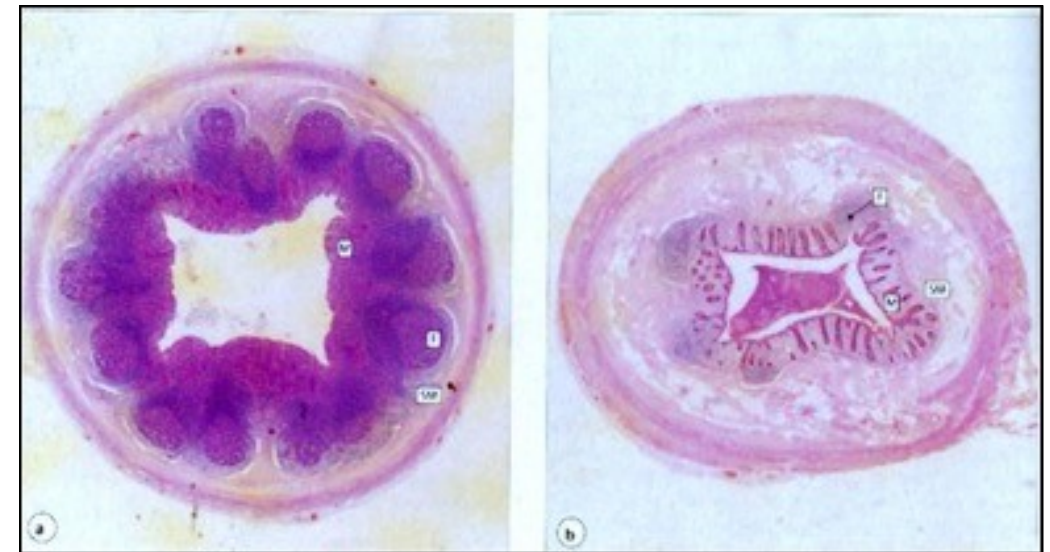
Small, worm-shaped diverticulum arising from caecum, 2-8 cm in length.

- Same structure of large intestine, with some modifications:

- Narrow lumen, no large folds.



lh5.googleusercontent



quizlet.com

# Structure of vermiform appendix

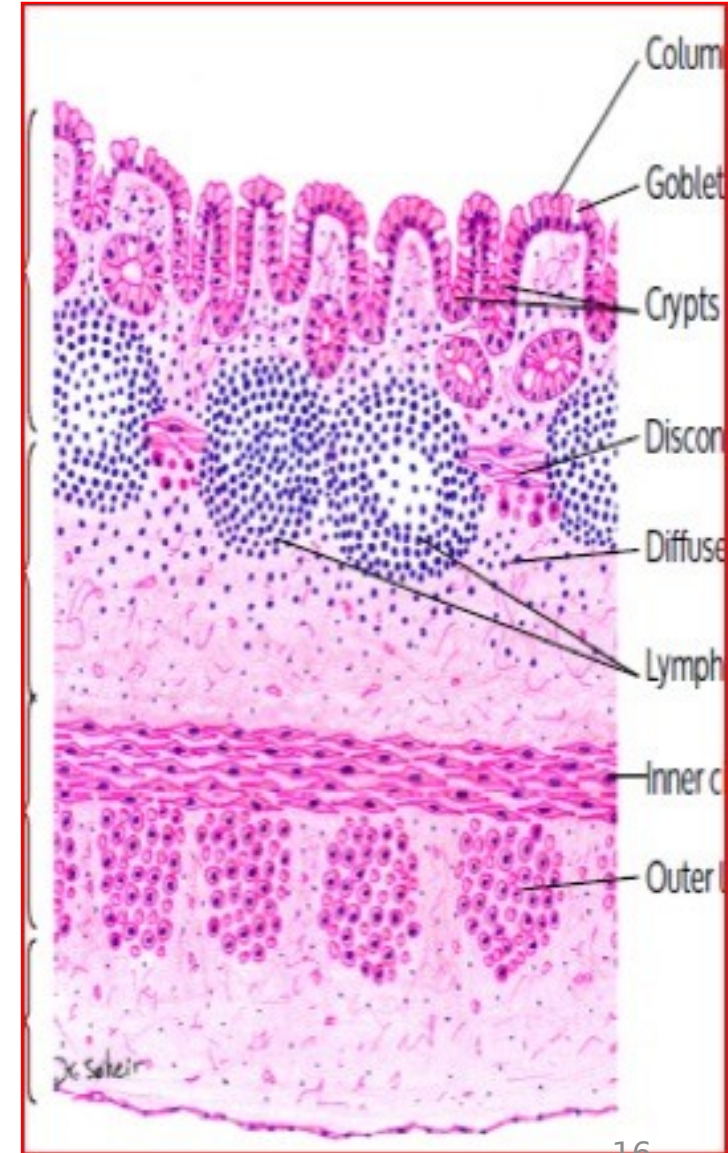


## 1- Mucosa

### a) Epithelial lining: simple columnar epith

- No Villi
- Crypts are irregular, very short and fewer in number, lined with cells as in large intestine (fewer goblet cells)

### b) Lamina propria (C.T. corium): Loose C.T., rich in *permanent GALT*, that may extend deep to submucosa (so, **M cells** are present in the epithelium overlying these aggregations).





# ***Structure of vermiform appendix***

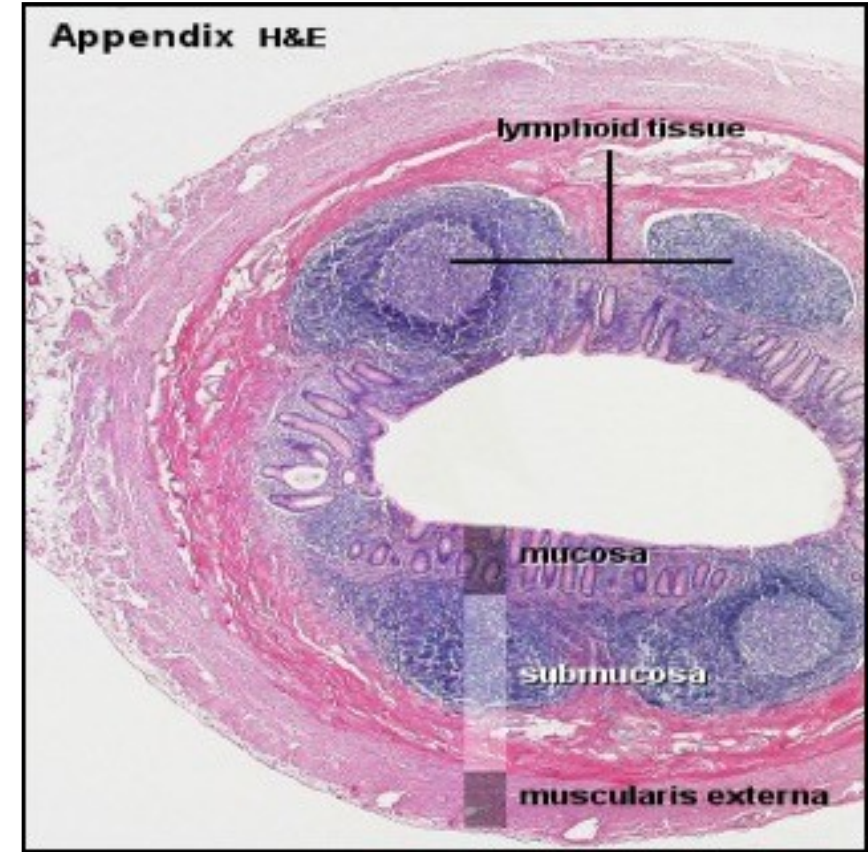


**2- Submucosa** Rich in lymphatic nodules.

**3- Muscularis**  
**a**

(no taenia coli).

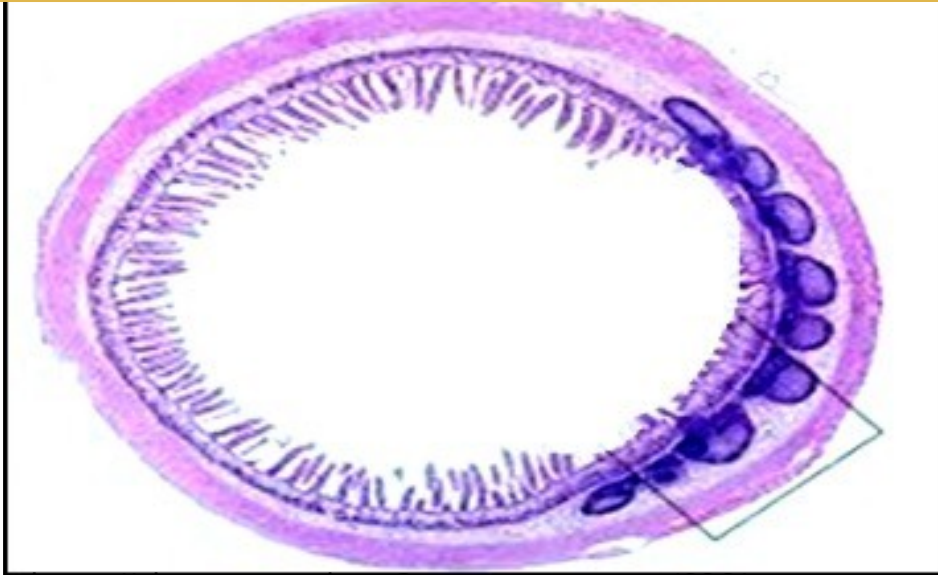
**4- Serosa** Induces epiploicae.



[https://images.slideplayer.com/27/9056074/slides/slide\\_24.jpg](https://images.slideplayer.com/27/9056074/slides/slide_24.jpg)

Compare between the structure of appendix & colon ??

# **Lecture quiz: Compare between structure of ileum & appendix**



<https://classconnection.s3.amazonaws.com/686/flashcards/1590686/png/picture31339381029705-thumb400.png>

## **Ileum**

- **Villi** + Crypts.
- Lymphatic Nodules: Only on the anti—mesenteric border



<https://image.slidesharecdn.com/lacutependicitis-151220060920/95/l-acute-appendicitis-6-638.jpg?cb=1450591787>

## **Appendix**

- **NO Villi. Crypts ONLY.**
- Lymphatic Nodules: All around

# Histological structure of the rectum



- Its histological structure is similar to the colon **EXCEPT that:**
  - **Crypts:** fewer in number, containing many goblet cells.
  - **NO tenia coli.**
  - **Adventitia** (not serosa).

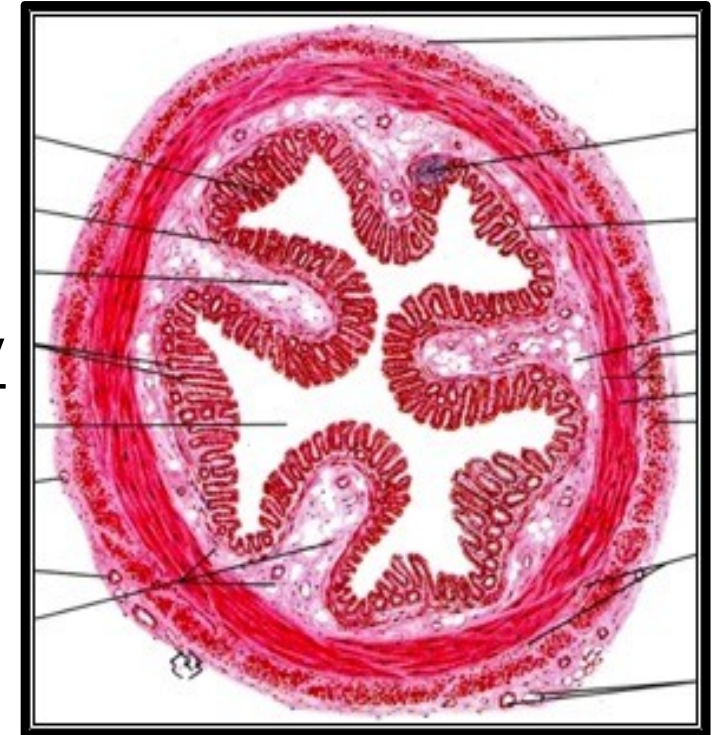


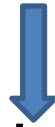
image.slidesharecdn.com



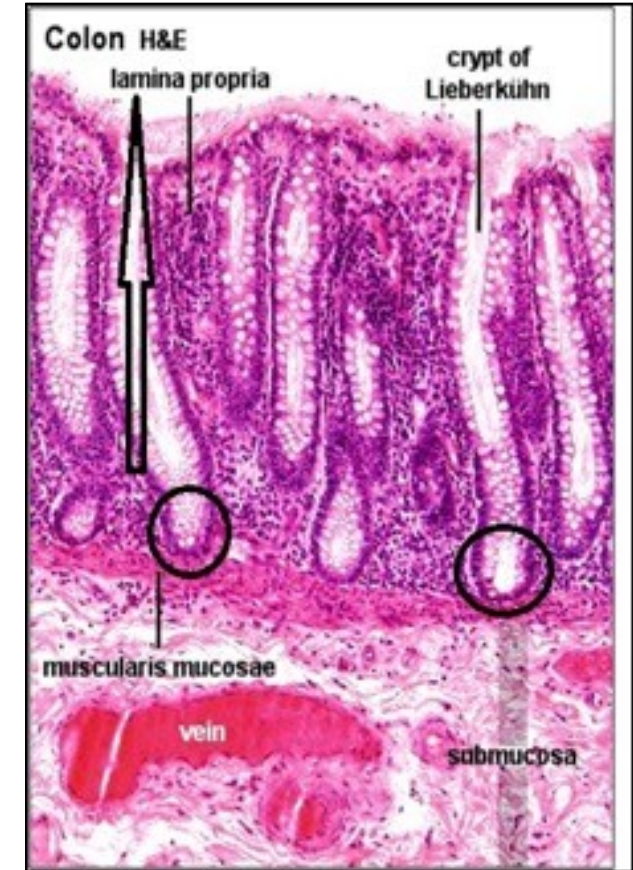
# Epithelial cell renewal of large intestine



Proliferation of the stem cells arises in the  
**lower half of the crypts.**



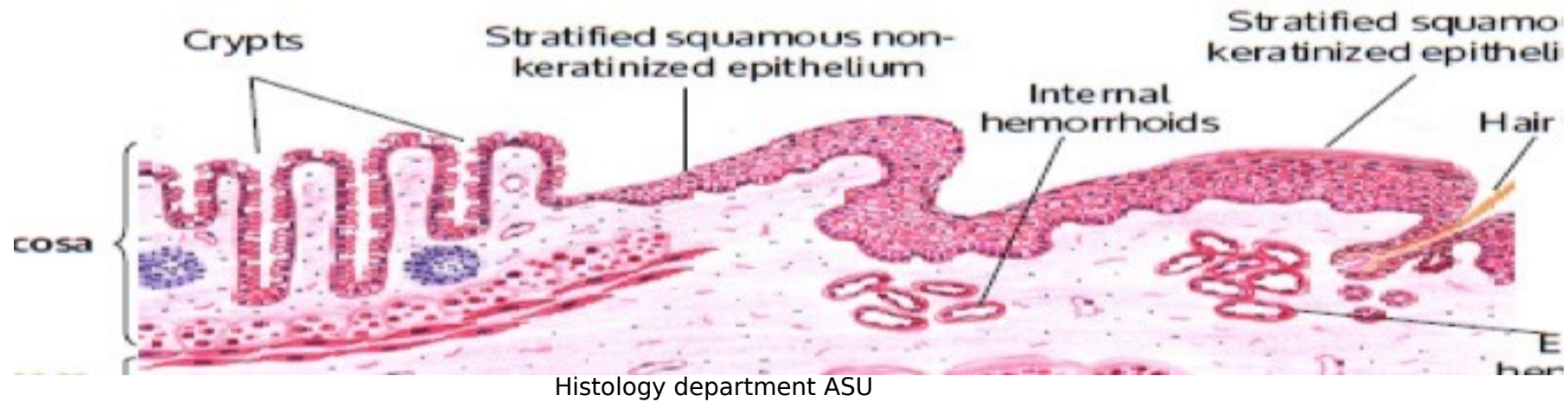
Then they migrate to the **surface**, where they  
are lost to the lumen.



.semanticscholar.



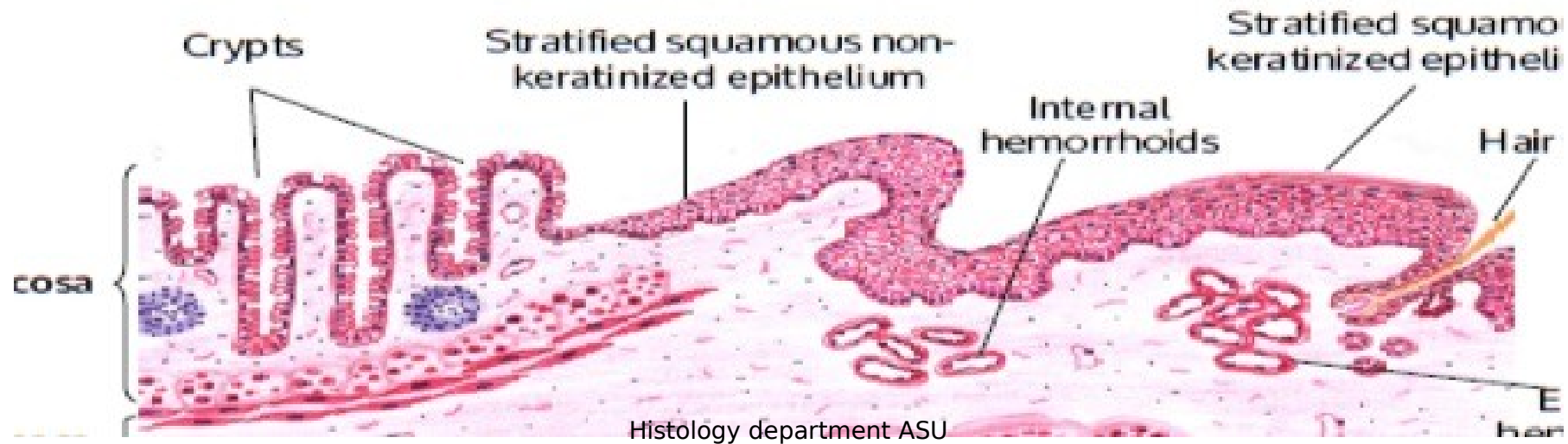
# Structure of the rectoanal junction



## Microscopically,

1. **Crypts** become **very short**, shallow then they **disappear**.
2. The **epithelium**: simple columnar in the rectum ➡ stratified squamous non-keratinized ➡ then continuous with the stratified keratinized epithelium of the skin.
  - At the anal orifice the epidermis of the skin shows hair follicles, sebaceous glands and **circum-anal glands**.

# Structure of the rectoanal junction



**3. The muscularis mucosa** continues as far as the rectal columns where it **subdivides** into bundles then **disappears**.

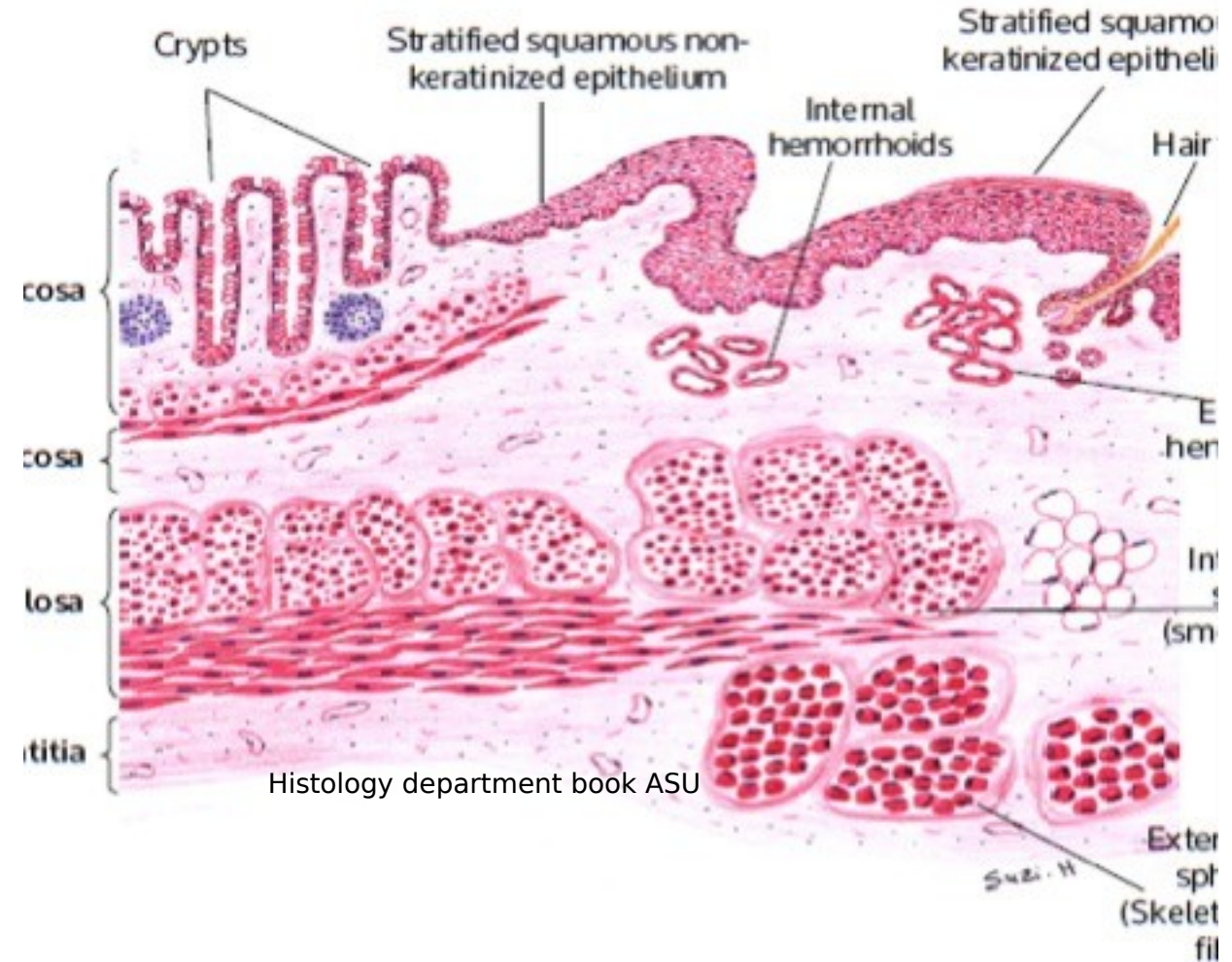
**4. The submucosa** fuses with the lamina propria and shows convoluted veins, which are called **internal hemorrhoidal plexus**. Closer to the anal orifice there are also veins called **external hemorrhoids plexus**.

# Structure of the rectoanal junction



5. The **inner circular muscle** fibers thicken to form the **internal sphincter**.

6. The **outer longitudinal smooth** muscle fibers ➔ extend between the internal and external sphincters ➔ **lost** in the dermis.



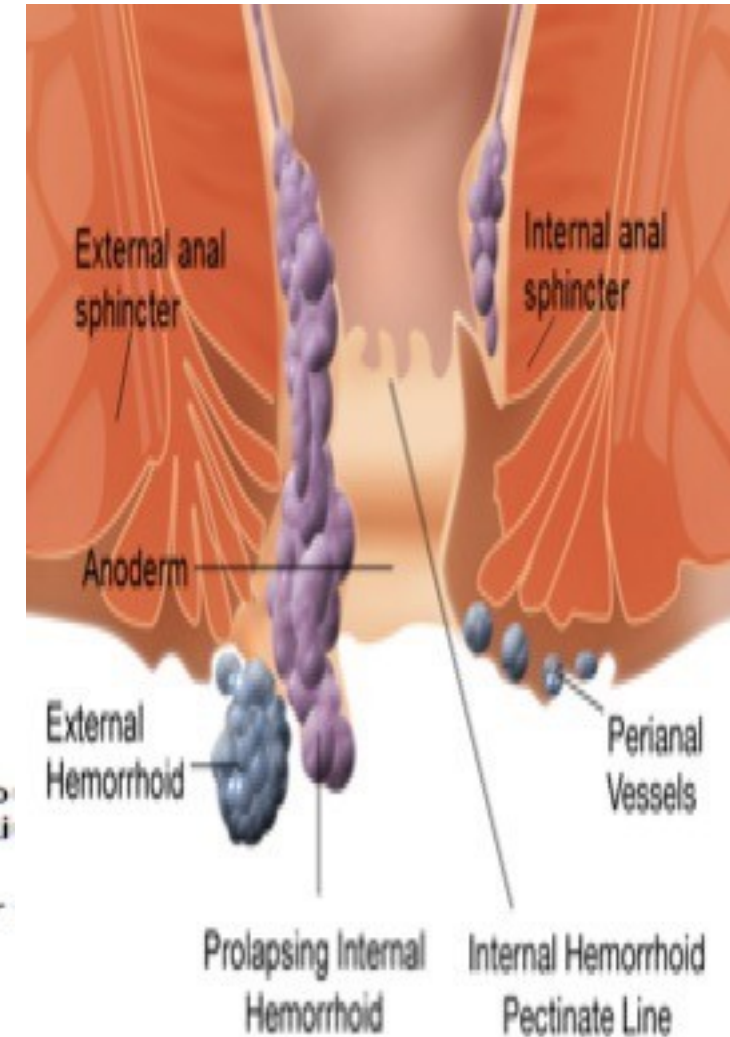


# Clinical application



## Hemorrhoids (Piles)

- Swollen blood vessels of the **mucosa or submucosal venous plexuses** of anal canal.
- It is manifested by pain and appearance of fresh blood with defecation (evacuation of feces).
- It is either **internal** or **external**.



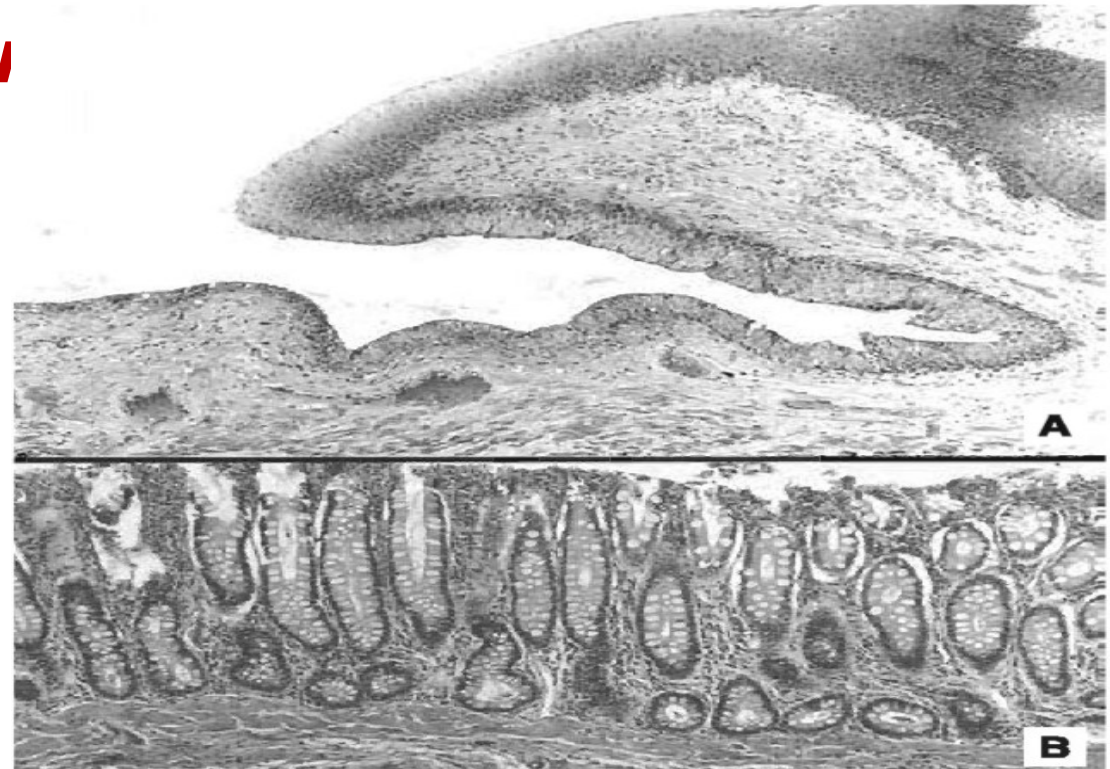


# Lecture Quiz



**A histologist views the accompanying tissues (A & B) in a biopsy. He determined that the tissues were normal. The presence of both of these tissues indicate that the sample was taken from the junction between which of the follow**

- a) Cheeks and lip.
- b) Ileum and colon.
- c) Anal canal and rectum.
- d) Esophagus and stomach.
- e) Stomach and duodenum.



## Key points of this lecture



- Microscopic characteristics of the colon.
- Comparison between cells lining colonic mucosa.
- Colon structure in diverticulosis and Hirschsprung disease.
- Microscopic structure of appendix vs rectum vs colon.
- Rectoanal junction structure and relation to occurrence of piles.

# Summary



The **large intestine** has three major regions: the short **cecum**, with the appendix; the long **colon**, with its ascending, transverse, descending, and sigmoid portions; and the **rectum**.

Along its entire length, the mucosa of the large intestine has millions of short simple tubular **intestinal glands**, lined by lubricant **goblet cells** and **absorptive cells** for the uptake of water and electrolytes.

The **muscularis** of the colon has its outer longitudinal layer subdivided into three bands of smooth muscle called **teniae coli**, which act in the peristaltic movement of feces to the **rectum**.

# Summary



At the **anal canal** the simple columnar epithelium lining the rectum shifts abruptly to **stratified squamous epithelium** of the skin at the **anus**.

- Near the anus the circular layer of the rectum's muscularis forms the **internal anal sphincter**, with further control exerted by **striated muscle** of the **external anal sphincter**.



# Suggested textbooks



- 1- Junqueira`s Basic Histology; Text and Atlas. 15<sup>th</sup> edition 2018, pp: 318-325.
- 2- Histology atlas and test: Michael H. Ross and Wojciech Pawlina, 7<sup>th</sup> edition, 2015, pp: 594-601.



**Thank  
You**

*Mahalo*  
**Kiitos**

*Tack*

**Grazie**

**Toda**

*Obrigado*

**Takk**

**Thanks**

**Gracias**

**Merci**